

Lewis University

STEM Undergraduate Research Experience

Faculty Mentor - Project Application

Dr. Brittany Stephenson
Department of Computer and Mathematical Sciences

*Using Mathematical Modeling to Identify Methods for Preventing
Clostridium difficile Transmission*

Abstract

The spore-forming, gram-positive bacteria *Clostridium difficile* can cause severe intestinal illness. A striking increase in the number of cases of *C. difficile* infection (CDI) among hospitals has highlighted the need to better understand how to prevent its spread. For years, mathematical models have been used to successfully amalgamate theory with procedures and data in order to simulate disease dynamics and predict emerging behaviors. In this work, we will build on one or two existing models of *C. difficile* transmission in order to improve their accuracy, match updated data, and inform better prevention methods. One of the existing models consists of a system of differential equations that can be solved numerically to observe the resulting disease prevalence. The second existing model is an agent-based model, which is a mathematical model that is purely based on simulation. Deciding which model(s) to study will depend on the student's preference. Oftentimes, models make simplifying assumptions that do not match real-world behavior to keep them from losing mathematical tractability. By modifying these models (and thereby increasing their complexity), we hope to be able to use mathematics to identify better control interventions and determine the biggest contributor(s) to the spread of the disease.